

COMMENTARY

The Importance of Communities for Mathematics Learning and Socialization¹

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Despite myths to the contrary, students attending urban schools are interested in learning and in mathematics, and they have communities and networks that are committed to their education and mathematics development. Too often, particularly for Black and Latina/o students, these networks and communities have gone unnoticed and unacknowledged—and, in fact, are often disregarded and denigrated as not essential to students' academic success.

In much of my work and research with schools and students, I have placed at the forefront students' voices and experiences, because these are so often missing from research discussions about teaching and learning. While it is important to consider the role of school-based learning communities (namely, the valuable relationships and interactions between students and teachers, primarily, but also extending to counselors and administrators) in students' learning, it is also important to value—and to further capitalize upon—the rich learning communities that young people may have outside of school.

One story from a research project exploring the formative, educational, and professional experiences of Black mathematicians (Walker, 2014) demonstrates the power of an extended learning community. Nathaniel Long (a pseudonym) grew up in Pittsburgh, and lived on a street where there were close familial and inter-generational ties:

I grew up in a—well, call it Little Italy—mostly Italian and some Irish and German, but all Catholic [neighborhood]. And then there were a smattering of Black families. My mother actually grew up [on the block] the generation before, so they all knew each other. It was very close-knit ... It was a pretty bright group of kids. Their mothers

¹ This commentary draws extensively from my Teachers College Press book *Building Mathematics Learning Communities: Improving Outcomes in Urban High Schools* (Walker, 2012a). My thanks to Lesley Bartlett for directing me to Deborah Brandt's work.

EDITOR'S NOTE: For a review of Professor Walker's 2012 book see "[Keeping the 'Welcome Sign' Lit: A Review of *Building Mathematics Learning Communities: Improving Outcomes in Urban High Schools*](#)."

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had grown up with my mother on that street and they were all college educated.... They're still living there. But there was a sort of intellectual atmosphere.... One of the kids, Henry, was about five years older than me and he would play ball with us younger kids. I would play chess with him, and he started giving me these little puzzles. He was very interested in mathematics. He ended up majoring in mathematics and became a secondary school math teacher. I was the oldest kid in that group—this group of kids that were really second generation on that street. So I was the one that was older and perhaps more interested in mathematics than the other kids. (pp. 39–40)

Many other mathematicians in that study reported that there were numerous people in their homes and neighborhoods who supported their mathematics learning and socialization beyond school walls. From their earliest mathematical memories engaging in family traditions and being exposed to mathematics concepts by family members and other adults; to teachers going above and beyond formal classroom parameters to introduce mathematicians to advanced material; to their participation in summer, after-school, or Saturday mathematics enrichment programs, mathematicians described significant exposure to mathematics during childhood and adolescence. Noteworthy is that the educational attainment of the family members (immediate and extended) who exposed them to these mathematics concepts ranged from little formal schooling to PhD completion.

Are teachers aware of students' potentially rich mathematical lives outside of school? Are they aware of the various networks and support structures for mathematics learning that students may be bringing with them to school? In my research with young people in urban high schools, they reported similarly rich out-of-school mathematics experiences and networks supporting their school mathematics learning (Walker, 2012a, 2012b). Furthermore, high school students and mathematicians alike, when reflecting on their adolescent experiences in school, reveal that some of the most pivotal moments for their mathematics interest and learning occurred when they were exposed to mathematics that was different from the typical textbook or worksheet exercise. Some of these moments were based on a brief conversation with a teacher outside of class about a mathematics concept, or a novel problem that incorporated mathematics content already "covered." Other moments were critical to young people's developing an understanding of mathematics as a wide-ranging discipline that could be appreciated for both its beauty and its usefulness.

One unfortunate outcome of multiple cycles of reform in mathematics education has been a narrowing effect on conceptions of mathematics. In an effort to improve student performance, too often teachers, schools, and districts—particularly, urban school districts—revert to assessments that primarily measure basic skills and elementary concepts and instruction that focuses on "recipes" for solving particular types of problems. Students come away from these experiences thinking that mathematics is a series of exercises without meaning, that mathematics is a

solitary activity, and that mathematics is solely about formulas and procedures with little use or relevance to their lives.

The broad mathematics opportunities afforded by learning communities extend beyond peers' focus on school mathematics (class problem sets, test preparation, and homework). Such learning communities can be composed of solely similarly aged classmates, or can include youth and adults across generations. They can focus on what is traditionally understood as "school" mathematics or they can focus on exploring mathematical topics not usually covered in school, the kind of mathematics that is often engaging and interesting for students and draws on their creativity in ways that school mathematics may not. Furthermore, the communities that support mathematics learning and socialization can be informal and inadvertent, or formal and intentional.

Young people's reports about learning communities reveal some important characteristics. The communities are marked by informed participants and/or observers who have high expectations for young people's learning of rigorous mathematical content, who often provide support or "push" for young people to persist in mathematics, and who engage in traditions that foster the development of effective mathematics learning behaviors. They also help to establish a sense of belonging to a broader mathematics community. As one mathematician reported about a committed teacher who extended the school day to teach her and her classmates advanced mathematics when the school district administration would not permit the offering of advanced courses: "When Mr. Holly said I could do math—that was it! I could do math."

We can draw from these characteristics to think about actions in classrooms that support the development of strong learning communities. For example, within the classroom, teachers should be aware that their instructional behaviors signal their interest in students' mathematics learning, and that students interpret these behaviors as indicators of teachers' perceptions and expectations (or lack thereof) for student success. Students speak very compellingly, honestly, and knowledgeably about the work of teachers. They are not expecting friendships but do expect (and respond well) to teachers who exhibit care about and interest in them and their learning and success. Teachers must be aware that their practices with students (for example, assigning low-level mathematics work repeatedly, not exposing students to engaging problems) may reflect their stereotypical notions of students' interest, competence, and potential, and that these practices can impede student progress and have cumulative and long-ranging impact on students' life outcomes.

Teachers should also be aware of the social aspects of learning, in particular, how students' peer groups support mathematics learning. They should be aware that students' peer group support for academic and mathematics behaviors is complex and nuanced—and that high achieving and so called low-achieving peers can support each other. More broadly, teachers should be aware that there are extensive

support networks for students' mathematics learning that may incorporate extended family members, peers, adults with little formal education beyond high school, and previous teachers.

One way to capitalize on students' informal learning communities within and beyond school is to develop peer tutoring programs for mathematics. In a study of one such peer tutoring program (Walker, 2012a), the work of the peer tutors revealed that students drew upon pedagogical strategies and interconnected content to help their struggling peers. To their peers, these explanations were novel and provided a new way of thinking about mathematics problems, even those problems that were not particularly complex. Indeed, there have been numerous studies that show the effectiveness of peer academic support for the learning of mathematics in college and university settings. The best of these programs incorporate several key concepts that bear repeating: First, they assume students are excellent and competent—they are not remedial programs. Second, they incorporate academically supportive peer groups that foster learning and engagement. Third, they are sustainable—most often sustained by committed leadership, but also by participants who carry out the mission of the program within the program's confines and beyond them. These programs and experiences are both formal and informal and occupy spaces that cross important boundaries—they encompass activities within and outside of classrooms, within formal educational institutions and within neighborhoods, among novices and experts, and among peers and mentors. This work supports the notion of repositioning students in the classroom as worthy contributors to the development of mathematics knowledge and understanding. In particular, promoting discussion and group problem solving in the classroom increases students' agency and active interest in their own mathematics learning, and ensures the development of metacognitive and problem-solving skills on which students can rely when they are participating in lifelong mathematics endeavors.

There is a rich and vibrant research landscape relating to mathematics learning communities—such research contributes to our understanding of mathematics identity and socialization (e.g., Boaler, William, & Zevenbergen, 2000; Martin, 2000) as well as the roles of power and agency in mathematics classrooms (Wagner, 2007) and the relationship of the quality of discourse (White, 2003) and student–student and/or student–teacher interactions to mathematics outcomes (Hand, 2010). I would argue, however, that with the prominent and largely negative popular culture and media discourse about mathematics in the United States there is considerable value in exploring how these constructs operate in out-of-school settings (e.g., Nasir, 2000) as well as in intergenerational contexts that broaden exposure to rigorous mathematics. How do young people describe their mathematics learning communities outside of school? What kinds of learning experiences for mathematics do these communities provide for young people, and how can we craft more of them? How should they be crafted? How do young people make sense of the connections between their out of

school mathematics learning experiences (especially those not focused on school mathematics activities) and their in-school mathematics learning? What types of interactions around mathematics are the best drivers for mathematics interest and engagement over time? For example, one mathematician recounted a vivid story about his grandfather using a porch to explore questions of infinity with him at an early age; the mathematician now shares this story with his students in his college classes to help develop their understanding of limit (Walker, 2014).

We can draw from the extensive literature on literacy practices (within and beyond schools) to develop a broader theoretical understanding of mathematics learning and socialization fostered by students' communities, whether those communities are informal or formal, intentional or serendipitous. Burns (2015) recently noted that elementary teachers have an extensive and multi-dimensional repertoire for reading instruction, but are apprehensive when it comes to designing mathematics instruction. They have less experience crafting learning experiences that elicit student imagination and creativity in mathematics than in reading and writing. Furthermore, there are many examples of spaces (book clubs, spoken word and essay contests, libraries) in which young people can engage in out-of-school literacy practices involving multiple modalities of expression (e.g., Vasudevan, 2009), but decidedly fewer analogous examples of extracurricular mathematics activities (for the most part, these are limited to mathematics circles, clubs, and teams). Indeed, I have argued elsewhere (Walker, 2012a, 2012b) that rich and varied *mathematical* spaces may be key to the development of mathematical identity as well as to the dissemination of mathematical knowledge.

Finally, Brandt (1998) suggests that “sponsors of literacy” are key agents who “enable, support, teach, model, as well as recruit, regulate, suppress, or withhold literacy—and gain advantage by it in some way” (p. 2). It is useful to consider who sponsors of mathematical learning are, what they do, and how “sponsorship” can enable rich practices of learning communities or impede them. Such a research agenda can inform how we make mathematics learning experiences as diverse, rewarding, engaging, transformative, and common-place as we do experiences related to multiple forms of literacy. It has the potential to not only enhance and improve mathematics teaching and learning, but also develop cadres of students with strong and positive mathematics identities, who are excited about mathematics, see themselves and are seen as talented, knowledgeable doers and users of mathematics, and are leaders of robust learning communities.

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